* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to a fuel cell.
[0002]
[Description of the Prior Art]A fuel cell is generated according to electrochemical reaction using the fuel gas which uses hydrogen as the main ingredients, and the oxidant gas containing oxygen. The substance discharged as a result of said electrochemical reaction is only water, and attracts attention as a clean power plant.
[0003]As for said fuel cell, many cells are generally laminated.
This cell is having structure which pinched the electrode unit which pinched the electrolyte by two electrodes (an anode and a cathode) with the separator which has a gas passageway of fuel gas or oxidant gas.

[0004]In said anode, when hydrogen gas contacts a catalyst, the following reaction arises.
[0005]$2H_2 \rightarrow 4H^+ + 4e^- H^+$ moves in the inside of an electrolyte, reaches a cathode catalyst, reacts to oxygen in the air, and becomes water.
[0006]Electromotive force arises by the reaction of the $4H^+ + 4e^- + O_2 \rightarrow 2H_2O$ above. Since said reaction is an exoergic reaction, it is necessary to cool it, and establishing a circulating-water-flow way in said separator is generally performed.
[0007]As conventional technology, the fuel cell with which the circulating-water-flow way is established in both sides, the opposite field, i.e., said cell, of the field facing the electrode unit of said separator, is indicated by JP,9-92309,A and JP,9-167623,A.
[0008]
[Problem(s) to be Solved by the Invention]However, since the plural laminates of said cell are

carried out and it is constituted as a fuel cell, conventional technology has the problem that it becomes a form where a circulating-water-flow way is provided between said cells, the length of a laminating direction becomes long, and the size of a fuel cell becomes large.

[0009]This invention is what solved the aforementioned problem, proposes a new structure of a circulating-water-flow way, and provides a small fuel cell.

[0010]

[Means for Solving the Problem]In order to solve the above-mentioned technical technical problem, technical means (the 1st technical means are called hereafter.) provided in claim 1 of this invention, In a fuel cell which consists of a separator which is the quadrangle thin plate state which has a gas passageway of an electrode unit which pinched an electrolyte by an electrode of a couple of an anode and a cathode, fuel gas, or oxidant gas, It is a fuel cell having provided a fuel gas flow route in one field of said separator, having established an oxidant gas passage in a field of another side, and establishing a circulating-water-flow way in both ends of the same flat surface as a double-sided gas passageway.

[0011]An effect by the 1st technical means of the above is as follows.

[0012]That is, since a gas passageway of fuel gas and oxidant gas was provided in both sides of one separator and a circulating-water-flow way was established in the same flat surface of said separator, thickness of said separator can be made thin and a fuel cell which laminated said separator can be miniaturized.

[0013]In order to solve the above-mentioned technical technical problem, technical means (the 2nd technical means are called hereafter.) provided in claim 2 of this invention, Plane shape of said separator is a rectangle and it is the fuel cell according to claim 1 establishing said circulating-water-flow way in both sides of both ends in alignment with a longitudinal direction of this separator.

[0014]An effect by the 2nd technical means of the above is as follows.

[0015]That is, since distance of a circulating-water-flow way and an electrode can be shortened, heat generated in an electrode can be efficiently told to cooling water.

[0016]In order to solve the above-mentioned technical technical problem, technical means (the 3rd technical means are called hereafter.) provided in claim 3 of this invention are the fuel cells according to claim 1 establishing said circulating-water-flow way of said separator only in one field of this separator.

[0017]An effect by the 3rd technical means of the above is as follows.

[0018]That is, since efficiency of cooling can be raised and a circulating-water-flow way becomes half, cost which manufactures a separator falls, and a fuel cell of low cost can be done.

[0019]In order to solve the above-mentioned technical technical problem, technical means (the 4th technical means are called hereafter.) provided in claim 4 of this invention are the fuel cells

according to claim 1 being said circulating-water-flow way fang furrow shape of said separator.

[0020]An effect by the 4th technical means of the above is as follows.
[0021]That is, since said separator and a cooling water touch area can be increased and a flow can also be improved, cooling efficiency can be raised.
[0022]In order to solve the above-mentioned technical technical problem, technical means (the 5th technical means are called hereafter.) provided in claim 5 of this invention are the fuel cells according to claim 1, wherein material of said separator is aluminum, stainless steel, or titanium.
[0023]An effect by the 5th technical means of the above is as follows.
[0024]That is, cooling efficiency by a circulating-water-flow way can be raised by using the above-mentioned large material of thermal conductivity compared with GABON currently generally used conventionally.
[0025]
[Embodiment of the Invention]Hereafter, the example of this invention is described based on a drawing.
[0026]Drawing 1 and drawing 2 are the near (an anode plane is called hereafter.) top views facing the side (a cathode surface is called hereafter.) and anode facing the cathode of the separator 1 used for solid polyelectrolyte type fuel cells for mount, such as a car of the 1st example of this invention.
[0027]The shape of said separator 1 is sheet metal of a long rectangle up and down, and construction material is aluminum. Since the construction material needs to tell the heat generated with the cathode and the anode early to cooling water, its aluminum with large thermal conductivity is good, but stainless steel and titanium may be sufficient as it. Such materials are excellent in corrosion resistance, and their thermal conductivity is larger than the carbon generally used to a separator.
[0028]The oxidant gas passage 2 is formed in the center of said cathode surface 1a, and the circulating-water-flow way 4 is established in the right and left of this oxidant gas passage 2.
[0029]The fuel gas flow route 3 is established in the center of said anode plane 1b, and the circulating-water-flow way is not established in this field.
[0030]The inflow-of-cooling-water manifold 5a with which cooling water flows is formed in the place corresponding to said circulating-water-flow way 4 of the right and left of the upper part of said separator 1, and the outflow-of-cooling-water manifold 5b with which cooling water flows out is formed in the place corresponding to said circulating-water-flow way 4 of the right and left of the lower part of said separator 1.
[0031]The oxidant gas inlet manifold 6a and the fuel gas inlet manifold 7a are formed in the upper part of said separator 1, and the oxidizing agent gas outlet manifold 6b and the fuel gas

outlet manifold 7b are formed in the lower part of said separator 1.

[0032]Since a majority of said separators 1 are laminated and constitute the fuel cell, said each manifolds are open for free passage, and they have become like one pipe, respectively. In order to prevent the leakage of oxidant gas, fuel gas, and cooling water, the seal of between said separators 1 and between each manifold and a channel is carried out.

[0033]Oxidant gas goes into said oxidant gas passage 2 through the oxidizing agent gas inlet 8a from said oxidant gas inlet manifold 6a, While passing through this oxidant gas passage 2, an electrode reaction is presented with oxygen in said oxidant gas with a cathode, and the gas which remained is discharged by said oxidizing agent gas outlet manifold 6b from the oxidant gas exit 8b.

[0034]Fuel gas goes into said fuel gas flow route 3 through the fuel gas inlet 9a from said fuel gas inlet manifold 7a, While passing this fuel gas flow route 3, an electrode reaction is presented with hydrogen in said fuel gas with an anode, and the gas which remained is discharged by said oxidizing agent gas outlet manifold 6b from the fuel gas outlet 9b.

[0035]Cooling water is discharged by said outflow-of-cooling-water manifold 5b through the circulating-water-flow way 4 from said inflow-of-cooling-water manifold 5a. The heat generated in an electrode is cooled by cooling water via the oxidant gas passage 2, the fuel gas flow route 3, and the circulating-water-flow way 4.

[0036]In this example, although the circulating-water-flow way is established in the same field as oxidant gas, it may provide in the same field as the field in which the fuel gas flow route was provided.

[0037]Drawing 3 is a horizontal decomposition sectional view of the solid polyelectrolyte type fuel cell which established the quirk-like circulating-water-flow way in one field of the separator of the 1st example of this invention. AA cross section of drawing 1 has shown.

[0038]10 is the electrode unit which pinched the solid polyelectrolyte membrane 12 with the anode 11 and the cathode 13, and was joined with the hotpress.

[0039]Said electrode unit 10 and the separator 1 are laminated by turns, and the fuel cell is constituted. Between said electrode units 10, the number of said separators 1 is one sufficient, and since it is not necessary to laminate the separator for cooling water and the length of the laminating direction of said fuel cell becomes short, they can do a small fuel cell.

[0040]In order to make it intelligible, the separator 1 actually emphasizes thickness more and is illustrated.

[0041]Drawing 4 - 7 are the horizontal decomposition sectional views of the solid polyelectrolyte type fuel cell of a modification example with which the structures of a circulating-water-flow way differ. The portion which is equivalent to AA cross section of drawing 1 as well as drawing 3 has shown.

[0042]Drawing 4 is a horizontal decomposition sectional view of the solid polyelectrolyte type

fuel cell of the 2nd example that established the quirk-like circulating-water-flow way 4a in both sides of the separator 1A. Since the area in contact with cooling water increases, the efficiency of cooling can be raised.

[0043]Drawing 5 is a horizontal decomposition sectional view of the solid polyelectrolyte type fuel cell of the 3rd example that established the circulating-water-flow way 4b of one crevice sectional shape in both sides of the separator 1B. It is easy to manufacture a circulating-water-flow way compared with said 2nd example.

[0044]Drawing 6 is a horizontal decomposition sectional view of the solid polyelectrolyte type fuel cell of the 4th example that established the circulating-water-flow way 4c of one crevice sectional shape in one field of the separator 1C. It is easy to manufacture a circulating-water-flow way further compared with said 3rd example.

[0045]Drawing 7 is a horizontal decomposition sectional view of the solid polyelectrolyte type fuel cell of the 5th example that established 4 d of quirk-like circulating-water-flow ways in one field of the separator 1D, and established the circulating-water-flow way 4e of one crevice sectional shape in another field. Since a circulating water flow can be increased and the touch area of said separator and cooling water can be increased, cooling efficiency can be raised.

[0046]

[Effect of the Invention]As mentioned above, in the fuel cell which consists of a separator which is the quadrangle thin plate state which has a gas passageway of the electrode unit in which this invention pinched the electrolyte by the electrode of the couple of an anode and a cathode, fuel gas, or oxidant gas, Since it is a fuel cell having provided the fuel gas flow route in one field of said separator, having established the oxidant gas passage in the field of another side, and establishing a circulating-water-flow way in the both ends of the same flat surface as a double-sided gas passageway, the length of the laminating direction of said separator can be shortened and a fuel cell can be miniaturized.

[Translation done.]